DIRECT TESTIMONY
OF PROGRESS ENERGY CAROLINAS, INC. WITNESS
MARK BYRD

SCPSC DOCKET NO. 2004-100-E

Q: PLEASE STATE YOUR NAME, YOUR BUSINESS ADDRESS AND THE POSITION YOU HOLD WITH PROGRESS ENERGY CAROLINAS, INC.

A: My name is Mark Byrd and my business address is 412 South Wilmington Street, Raleigh, North Carolina 27601. I am Manager of Transmission Planning with Progress Energy Carolinas, Inc. (PEC) in the Transmission Department.

Q: PLEASE STATE BRIEFLY YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND?

A: I am a graduate of North Carolina State University with a Bachelor of Science and a Master of Science Degrees in Electrical Engineering. I began working with PEC in 1980 and during my career I have held various positions in the System Planning & Operations Department and the Transmission Department.

I have been Manager of Transmission Planning for PEC for nine of the last ten years. I held the position of Manager of Power System Operations at the A.J. Skaale Energy Control Center for the remainder of this period. I also held an engineering staff position for PEC in Transmission Maintenance for approximately two years.

I am a Registered Professional Engineer in the state of North Carolina. I am also a member of the Virginia - Carolinas Sub-Region (VACAR) Planning Task Force of the Southeastern Electric Reliability Council (SERC).

Q: WHAT ARE YOUR CURRENT RESPONSIBILITIES WITH PEC?

A: I am responsible for the long-range transmission infrastructure plans for PEC. My work group performs continuous assessments of the electric system requirements of the transmission system in PEC's service territory to help ensure a continued reliable supply of electric service to homes and businesses. This includes components with a voltage of 69-kV and higher.

Q: WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to describe the need and necessity for the construction of the new Florence-Marion 230-kV and Marion-Whiteville 230-kV transmission lines.

Q: PLEASE DESCRIBE THE TRANSMISSION PLANNING PROCESS AT PEC.

A: PEC adheres to the Planning Standards established by the North American Electric Reliability Council (NERC), the Southeastern Electric Reliability Council (SERC), and PEC's Planning Criteria and Assessment Practices. The ability of the transmission system to meet the planning criteria is assessed for specified contingencies.

No PEC bulk power facility, such as transmission lines, transmission-to-transmission transformers, transmission breakers, etc., is to exceed the facility's rating under normal and contingency conditions. Standard contingency analysis includes one generating unit off-line during the loss of one transmission facility (line or transformer) or both lines on a common structure. An exception to this is at the Brunswick Nuclear Plant where, due to its geographic location, both units are taken off-line in conjunction with the loss of one transmission facility or both lines on a common structure.

Transmission planning efforts normally take into consideration a ten year planning horizon. This time span is sufficient to identify projects and provide a reasonable

estimate of the financial requirements. Required engineering, scheduling and construction lead times can be satisfactorily accommodated within this planning period. Planning is based on the Company's long-range system peak load forecast, which includes all territorial load and contractual obligations; the Company's resource plan; and local area forecasts for retail, wholesale, and industrial loads. PEC's transmission planning process identifies changes to the transmission system that are necessary to ensure continued safe, reliable, and economic operation of PEC's power system.

Q: WHAT CRITERIA DOES PEC USE TO DETERMINE WHEN NEW TRANSMISSION FACILITIES ARE NEEDED?

A: As stated previously, PEC subscribes to the Planning Standards established by the North American Electric Reliability Council (NERC) and PEC's Planning Criteria and Assessment Practices. In accordance with these standards, PEC plans its transmission system such that the network can be operated to supply projected customer demands and projected firm purchases and sales, at all demand levels over the range of forecast system demands, under contingency conditions. These criteria are included in this filing as Exhibit 1 to my testimony.

Q: WHY IS IT NECESSARY FOR PEC TO CONSTRUCT THE NEW 230-kV TRANSMISSION LINE FROM THE FLORENCE 230-kV SUBSTATION IN FLORENCE, SOUTH CAROLINA TO THE MARION 230-kV SUBSTATION, NORTH OF MARION, SOUTH CAROLINA DESCRIBED IN MR. WILSON'S TESTIMONY?

A: PEC's continuous assessment of electric system requirements has identified the need for the transmission project, one of several planned or underway in PEC's service territory, to help ensure a continued reliable supply of electric service to homes and businesses.

The area between Florence and Marion, South Carolina is mostly rural. There is, however, significant projected growth in the region and there are also several large industries along this corridor. Loadings on the existing transmission lines in this corridor are significantly impacted by certain critical generation and transmission conditions. Load growth, coupled with line loadings under contingency conditions, will result in the degradation of reliability to unacceptable levels by the summer of 2007.

Specifically, the credible planning contingency of a planned or forced shutdown of the Brunswick Plant coupled with the loss of the 230-kV line from Florence to Latta will produce line loadings in excess of the 201 MVA rating of the Florence DuPont-Marion 115-kV line. Figure 2-1, in Exhibit B - Routing Study and Environmental Report - Florence to Marion, illustrates the forecasted overload in 2007 of 106% of the line's thermal rating during this contingency.

It has become clear that the transmission line between Florence and Marion is the weak link in moving power from the Hartsville area generating plants at Darlington County and Robinson into the Pee Dee area and southeastern North Carolina, especially during the planning contingency cited above. Upgrading the existing transmission lines simply will not economically and reliably provide the needed capability. An additional transmission line from Florence to Marion is needed.

Q: PLEASE EXPLAIN ALL OF THE ALTERNATIVE METHODS STUDIED, FOR

THE FLORENCE-MARION LINE, BY PEC TO DETERMINE THE MOST APPROPRIATE SOLUTION TO THE PROBLEMS YOU JUST DESCRIBED.

A: Once PEC had established that the transmission system in the Florence-Marion region would need enhancement by 2007 in order to continue to provide reliable electric service, studies were performed to evaluate the proposed alternatives for the project and to determine the optimum solution from among them. As stated above, the Florence DuPont-Marion 115-kV line was found to have potential overload problems associated with it under contingency conditions.

Florence-Marion line alternatives considered:

Alternative 1: Convert the Florence-Marion 115-kV line to 230-kV. This alternative requires right-of-way expansion in some already congested areas, conversion of two substations to 230-kV, and the development of a 115-kV feeder. This alternative requires approximately 50% more miles of line than the selected alternative. Because this would be an upgrade of an existing facility, the net improvement in capacity between Florence and Marion would be significantly less than the selected alternative and would have a shorter useful life. Further, the converted line would have limited ability to serve new load because the existing line is south of Florence and the majority of growth in the Florence area is to the north. In summary, this alternative is significantly more expensive and less effective that the selected alternate.

Alternative 2: Reconductor the Florence DuPont-Marion 115-kV line. This alternative would require the addition of new transmission structures for most of the line and replacement of a significant number of existing structures. Further, studies indicate

that the resulting reduction in impedance between Florence and Marion would result in overloading of the Florence-Florence DuPont 115-kV line within a short time, necessitating reconductoring of this facility as well. As in Alternative 1 above, this would be an upgrade of an existing facility. Reconductoring these existing lines would expose existing customers to potential outages during the construction sequence. The net improvement in capacity between Florence and Marion would be significantly less than for the selected alternative and would have a shorter useful life. Serving new Florence load from this line would further decrease this alternative's useful life. In summary, while comparable in cost, this alternative is much less effective than the selected alternate and would expose existing customers to outages during construction.

Alternative 3: Establish an interconnection with Santee-Cooper at Marion. This alternative provides a new source of support for the Marion area and thus relieves loading in the Florence-Marion corridor. Unfortunately, under this configuration, contingencies on the Santee-Cooper system can cause overloads on the existing transmission system. As a result, this alternative does not solve the problem.

Alternative 4: Reconfigure the Florence DuPont-Hemingway (Santee-Cooper) 115-kV tieline and the Florence Marion 115-kV line. This alternative would uncross the Florence DuPont-Hemingway 115-kV and the Florence-Marion 115-kV lines by reconnecting them at the point where they cross. This would form a Florence-Florence DuPont 115-kV line and a Marion-Hemingway 115-kV line. Unfortunately, overloads can still occur under other credible contingencies, making this a non-viable solution.

Alternative 5: Connect lines by establishing a new 115-kV switching station. This alternative would create a new switching station at the crossing point of the Florence-Marion and Florence DuPont-Hemingway 115-kV lines. Unfortunately, overloads can still occur under other credible contingencies, making this a non-viable solution.

Alternative 6: Construct a second Florence-Latta 230-kV line. Since the loss of the original Florence-Latta 230-kV line causes excessive loading in the Florence-Marion corridor, a second Florence-Latta 230-kV line was considered. Further studies showed that a second Latta-Marion 230-kV Line would also be required making this alternative cost-prohibitive.

Q: WHY IS IT NECESSARY FOR PEC TO CONSTRUCT THE NEW 230-kV TRANSMISSION LINE FROM THE NICHOLS 115-kV SUBSTATION NEAR NICHOLS, SOUTH CAROLINA TO BRUNSWICK EMC'S PEACOCK POD NEAR CHADBOURN, NORTH CAROLINA TO COMPLETE THE MARION-WHITEVILLE 230-kV LINE AS DESCRIBED IN MR. WILSON'S TESTIMONY?

A: The area between Marion, South Carolina and Whiteville, North Carolina is mostly rural, with many small towns. The existing transmission line serving this area has been in service for many years and has a smaller wire size (556.5 MCM ACSR) than what would be used today.

Continuing load growth coupled with certain critical generation and transmission conditions will overload the existing transmission lines in the Marion-Whiteville area by the summer of 2007, resulting in an unacceptable degradation of reliability.

Specifically, the credible planning contingency of a planned or forced shutdown of the Brunswick Plant coupled with the loss of the 230-kV line from Cumberland to Whiteville will produce line loading in excess of the 178 MVA rating of the Marion-Whiteville 115-kV Line. Figure 2-1, Exhibit D - Routing Study and Environmental Report - Marion to Whiteville, illustrates the forecasted overload in 2007 of 106% of the line's thermal rating.

In the mid 1980's, to remedy voltage and loading problems on this line, 14.8 miles of new 230-kV transmission line was constructed from Marion to Nichols. This new construction became part of the existing line (operating at 115-kV) and the Mullins and Nichols substations remained on the old line, which was then operated as a feeder.

It was determined that during 2001, loading on the Marion-Whiteville 115-kV line under high load conditions could produce unacceptably low voltage when the Whiteville terminal was out of service. It was this problem which led to the construction of a new 7-mile 115-kV feeder from Whiteville to Brunswick EMC's Peacock POD in 2002. In anticipation of future need, this feeder was constructed for 230-kV.

Currently, there is 230-kV capability that reaches from Marion toward Whiteville at one end and from Whiteville toward Marion at the other end. The "gap" between these line sections is approximately 21 miles.

The proposed project is to construct approximately 21 miles of 230-kV line. The new line will complete the "gap" and result in a new transmission connection from Marion to Whiteville, constructed to operate at 230-kV. This will provide a second direct path from Marion to Whiteville. The new line will be operated initially at 115-kV. Area

substations and EMC PODs on these two lines will be served in such a manner as to relieve contingency overloading and to provide adequate voltage. At such time as it is necessary, the newly constructed line section, along with the sections already completed, will be changed to 230-kV operation. Area substations and EMC PODs will be converted to 230-kV when necessary.

Q: PLEASE EXPLAIN ALL OF THE ALTERNATIVE METHODS STUDIED, FOR THE MARION-WHITEVILLE LINE, BY PEC TO DETERMINE THE MOST APPROPRIATE SOLUTION TO THE PROBLEMS YOU JUST DESCRIBED.

A: Once PEC had established that the transmission system in the Marion-Whiteville region would need enhancement by 2007 in order to continue to provide reliable electric service, studies were performed to evaluate the proposed alternatives for the project and to determine the optimum solution from among them. As stated above, the Marion-Whiteville 115-kV line was found to have potential overload problems associated with it under contingency conditions.

Marion-Whiteville line alternatives considered:

Alternative 1: Rebuilding the existing line. The structures on this existing 115-kV line were not built to carry larger conductor, thereby eliminating any reconductoring option without replacing the structures. Further, construction costs for a rebuild would be nearly as much as for construction of an all-new 230-kV line. The net improvement in capacity between Marion and Whiteville would be significantly less than for the proposed alternative and would have a shorter useful life. Finally, at 115-kV, the line would not be able to provide adequate voltage support for more than a few years.

Alternative 2: Converting the existing line to 230-kV. This alternative would require voltage conversion of five substations and two EMC PODs in addition to the line. This is not cost-effective and it would require considerable temporary construction and several customer outages. Additional right-of-way also would be required, not only for the main line, but for several long 115-kV tap lines. Compared to the rebuilding alternative, voltage support would be improved, but not as significantly as the proposed alternative. Other loading issues in the area emerge when the converted line is under outage and therefore additional transmission improvements would soon be required.

Alternative 3: Constructing a second Cumberland-Whiteville 230-kV line. Since the loss of the original Cumberland-Whiteville 230-kV line causes excessive loading in the Marion-Whiteville corridor, a second Cumberland-Whiteville 230-kV line could eliminate the loading problem. However, since a second Cumberland-Whiteville 230-kV line would not be in the Florence-Whiteville corridor, it would add no benefits for serving load and voltage issues would still exist. Since this line would be more than twice the length of the proposed new Marion-Whiteville 230-kV line section, this would not be a cost-effective solution.

Q: ARE THE PROPOSED NEW FLORENCE–MARION AND MARION–WHITEVILLE 230 kV TRANSMISSION LINES THE MOST COST-EFFECTIVE OPTIONS FOR PROVIDING THE NEEDED TRANSMISSION SYSTEM UPGRADES?

A: Yes, for the reasons described above, the proposed new lines are both the most economical alternatives and will produce the greatest service reliability for PEC's

customers. These projects provided the best overall long-term system enhancements and were chosen as the optimum solution to the system's long-term needs.

Q: DOES THE PUBLIC CONVENIENCE AND NECESSITY REQUIRE THE CONSTRUCTION OF THESE TRANSMISSION LINES?

A: Yes, in the absence of these transmission lines PEC will soon begin to experience overloads under the contingency conditions of loss of area generation coupled with the loss of an area transmission line. The proposed two new 230-kV lines will relieve the overloading in the existing corridors and will provide for long term load growth in PEC's Southern and Eastern regions.

Customer growth in population and electric usage is expected to place greater demands on the distribution and transmission systems in PEC's Southern and Eastern regions. Load growth is projected to increase approximately two to three percent each year for the next ten years.

These projects will reduce contingency loadings on the existing transmission lines to acceptable levels, allowing the Robinson Plant and Darlington County Plant generation complex to operate at full output to help PEC meet customer demands for electricity in both regions. These projects would also improve the power quality and reliability in the area, and reduce the frequency and duration of potential power outages. Without the transmission system upgrades, load in the area would exceed the electric system capability in the near future.

Q. DO THESE NEW TRANSMISSION LINES SERVE THE INTERESTS OF SYSTEM ECONOMY AND RELIABILITY?

A. Yes. Continuing load growth coupled with contingency conditions will result in overloads on the existing transmission lines in the Florence – Marion – Whiteville area, and a degradation of reliability to unacceptable levels by the summer of 2007. The proposed new transmission lines will provide the additional transmission system capability necessary to prevent the overloads and maintain adequate reliability.

PEC's transmission system is used to transfer power from its diverse mix of geographically dispersed generation resources to provide economical electricity to its customers. PEC economically dispatches its generating plants to provide the lowest cost mix of energy to its customers. Without the addition of the two new transmission lines, overloading of the existing transmission system would inhibit the transfer of economical power to serve PEC's customers. In this case, PEC would be unable to transmit to its customers the low-cost power produced by its generating plants in Darlington County, resulting in higher costs to consumers. Constructing the two new 230 kV lines will alleviate the potential overload and facilitate the continued transmission of low-cost power resulting in economical operation of PEC's system.

The proposed two new transmission lines are clearly in the interests of system economy and reliability.

Q: DOES THIS CONCLUDE YOUR TESTIMONY?

A: Yes.

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PEC Transmission Planning Assessment Practices

The following transmission planning assessment practices are used by PEC:

NERC Planning Standards

PEC adheres to the applicable NERC Planning Standards. These Standards are available on the NERC website (www.NERC.com)

Regional Transmission Assessment Practices

- The PEC transmission system is tested in accordance with the "SERC Supplements to the NERC Planning Standards." This document is available from the SERC Office.

- PEC currently participates in several regional bulk transmission studies. These include studies performed by the VACAR (Virginia-Carolinas Subregion of SERC), VAST (VACAR-AEP-Southern-TVA-Entergy), VST (VACAR-Southern-TVA-Entergy), and VEM (VACAR-ECAR-MAAC) study groups. These studies evaluate the bulk transmission system to ensure that the interconnected system is capable of handling both normal and emergency transactions.

Additional Assessment Practices Used By PEC

- The ability of the transmission system to meet the planning criteria is assessed for specified contingencies. Contingencies are assumed to occur at the time of the summer, or winter, coincident peak load without interruptible load management. The following contingencies are assessed:

  (1) the loss of both Brunswick Nuclear Plant generating units, or of any other single generating unit, in combination with the loss of any bulk power transmission system component or two transmission lines which are built on common structures, or

  (2) the loss of any single transmission component or two transmission lines which are built on common structures.

  A transmission system component can be a transmission line, circuit breaker, transformer, or any other facility or piece of equipment which might open a circuit. This component may be located within PEC, on a foreign system, or on a PEC interface.

- The ability of the transmission system to meet the planning criteria while delivering a plant's maximum generating output is assessed for normal and single contingency conditions. For selected baseload plants, the system is assessed during double contingency conditions.

Generator unit stability is assessed in accordance with NERC Planning Standard I. A. Certain generating plants on the PEC system are tested for 3-phase faults.